

CLAIMS:

1. Method for manufacturing a floating gate type semiconductor device on a substrate (2) having a surface, the method comprising:
 - forming, on the substrate surface, a stack comprising an insulating film (4), a first layer of floating gate material (6) and a layer of sacrificial material (8),
 - 5 - forming at least one isolation zone (18) through the stack and into the substrate (2), the first layer of floating gate material (6) thereby having a top surface and side walls (26),
 - removing the sacrificial material (8), thus leaving a cavity (20) defined by the isolation zones (18) and the top surface of the first layer of floating gate material (6), and
 - 10 filling the cavity (20) with a second layer of floating gate material (22), the first layer of floating gate material (6) and the second layer of floating gate material (22) thus forming together a floating-gate (24).
2. Method according to claim 1, furthermore comprising, after filling the cavity (20), partially removing the isolation zones (18) so as to expose part of the side walls (26) of the floating gate (24).
- 15 3. Method according to claim 2, the second layer of floating gate material (22) having side walls, wherein the isolation zones (18) are removed so as to completely expose the side walls of the second layer of floating gate material (22) and part of the side walls (26) of the first layer of floating gate material (6).
- 20 4. Method according to any of the previous claims, furthermore comprising the step of forming a control gate (30) and an interlayer dielectric (28) between the floating gate (24) and the control gate (30).
- 25 5. Method according to any of the previous claims, furthermore comprising the step of forming a protection layer between the first layer of floating gate material (6) and the sacrificial layer (8).

6. Method according to any of the previous claims, wherein the sacrificial material (8) is any of a nitride layer, an oxide layer or a silicon carbide layer.
- 5 7. Method according to any of the previous claims, further comprising, after filling the cavity (20), removing floating gate material (22) present outside the cavity (20).
8. Method according to any of the previous claims, wherein the first layer of floating gate material (6) and the second layer of floating gate material (22) are the same
10 material.
9. A floating gate type semiconductor device, comprising:
- a substrate (2) having a surface,
 - a stack of layers on the surface comprising an insulating film (4), a first layer
15 of floating gate material (6), and
 - a second layer of separately deposited floating gate material (22) on said first layer of floating gate material, the first and second layers forming together a floating-gate (24).
- 20 10. A non-volatile memory including the semiconductor device according to claim 9.